them. Such courses could, say in a four-year undergraduate programme, cover the technological, behavioural, managerial, sociological and political aspects of information, at a level sufficient to make their graduates capable of communicating with scientists and technologists and of specifying the performance requirements of improved information systems for them rather than of designing systems. Curricula could be devised in interdisciplinary consultation among academic representatives of professional societies such as the Royal Australian Chemical Institute, the Institution of Engineers Australia and the Library Association of Australia. To which schools or faculties such courses are attached should absorb much less of their planners' energy than concern for their introduction while the political climate is favourable and for the insurance of adequate support for them. There is again no reason why similar courses could not be provided for the social sciences. The Postgraduate School of Librarianship and Information Science at the University of Sheffield has for several years run a successful M.Sc. in Information Studies programme which is open to graduates in science and technology. In October 1973 Sheffield began teaching a course leading to the degree of M.Sc. in Information Studies (Social Sciences). The Nuffield Foundation has funded the introduction of the new course in the hope that its graduates will prove as useful as information specialists in the social sciences as graduates of the earlier established course have proved in science and technology. At undergraduate level, Leeds Polytechnic has recently restructured the three-year B.Sc. Information Science programme first offered in 1964. This course combines basic physics, chemistry and biology with study of modern languages and of the sociology of information transfer in science as well as of information storage and retrieval systems. The Departments of Librarianship, Sciences, International Studies, Mathematics and Computing, and Business Studies are involved in teaching it.

At the research level in Australia encouragement needs to be provided in the form of opportunities for advanced study of the information needs and information processing capabilities of particular groups and of the characteristics of all the information systems which govern our lives. How else but through combinations of the talents of scholars interested in fundamental problems of information and drawn from every discipline is "the human use of human beings" to be achieved? The phrase is of course borrowed from Norbert Wiener, one of those who helped convince us of the pervasive importance of information in all the systems which make up man and his world and who thus set us on the search for a basic science of information—a science for which a satisfying

general theory may only be found after the environments in which it is sought have multiplied and diversified.

NOTES

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A MASTER'S DEGREE PROGRAMME IN ADMINISTRATIVE STUDIES AT THE AUSTRALIAN NATIONAL UNIVERSITY

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BEGINNING in the 1974 academic year, the Faculty of Economics in the School of General Studies at the Australian National University will offer a new twelve-month Master's degree programme in Administrative Studies. This note provides the rationale for that programme and a brief overview of its structure.

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Programme Rationale and Structure

The objective of the programme implicit in the terms of reference laid down by the university is, in the ultimate sense, to contribute to more effective policy in administrative units, and, in the immediate and operational sense, to improve the capacity of individuals in these administrative units to function in policy analysis and evaluation, in policy decision making, and in policy implementation. The relevant administrative units include the various dimensions of the public sector, which offers not only three formal levels of government, but revenue collection, resource allocation, and interventionist activities, and also components of the private sector which, in turn, offers a spectrum of "diminishing publicness" as one moves from largely and specifically regulated private units to units in which regulation takes the form only of the general legal framework for private activity. The distinction between the public and private sectors, particularly in the case of large administrative units, is more one of form than of substance, and the programme will focus on the various aspects of both, and on their interface.

The objective so defined is operational inasmuch as its degree of attainment can be demonstrated and evaluated in the ultimate sense in more effective policy. The proposal set out below represents a first view of how the programme objective can best be attained. In the very nature of a testable objective, however, the structure proposed must be seen as flexible and subject to revision in the light of its performance.

The case for the establishment of such a programme lies in the generally poor performance of policy analysis, decision making and implementation, by no means exclusively in the public sector, and in the corresponding need, first, to provide more effective policy analysis, second to clarify the complex black box into which policy inputs (including policy analysis) are poured and from which emerge policy decisions, and third, to clarify the equally complex black box between policy decision and policy output or performance.

How ought such a substantial charge to be approached? Programmes in administrative studies or sciences are frequently taught essentially within the framework of a particular conventional academic discipline such as Psychology, Political Science, Economics or Mathematics. The criterion of rigour in such courses then becomes the mastery of the appropriate disciplinary technical repertoire. If, however, one defines rigour in terms of the programme objective defined above—i.e., in terms of the contribution of the

programme to the attainment of that objective—and further accepts that the complex nature of policy analysis, decision-making and implementation is not amenable to effective treatment solely within the boundaries of a conventional discipline, then the implications for the programme structure are that the programme must provide not simply or even primarily for the acquisition of technical expertise in a particular discipline, but for the mastery of the set of skills, seen as a coherent, composite body of knowledge, required to attain the objective of the programme.

The programme must then, it is argued, be both *multidisciplinary*, involving a role for the variety of skills necessary for the attainment of the programme objective and *interdisciplinary*, inasmuch as the set of disciplinary skills and methodologies must be demonstrated to constitute a composite, coherent body of knowledge, and formally integrated in a new synthesis, or set of paradigms, or way of thinking and approaching policy analysis, decision and implementation.

In the very complexity of the problems of policy analysis, decision and implementation, the range of useful methodologies and skills is almost endless. How, for instance, can a good policy analyst, decision maker or implementer be ignorant of the basic approaches of the physical and life sciences, or be a philistine in the area of culture and the humanities? But an essential feature of a feasible degree programme is its finitude, and one is compelled to define strict priorities and limits in the definition of the programme and to focus on that set of skills and methodologies considered most basic and seminal. The range of approaches suggested is an attempt at a marriage of the decision and behavioural sciences in what might be called a "Policy Sciences" programme.*

The suggested programme structure is summarised in Chart 1. The programme includes the basic analytical and decision apparatus of microeconomics; the methodologies of systems dynamics and management cybernetics, the range of skills generally subsumed under the rubric of Operations Research, the basic approaches of statistical inference in the Social Sciences (which we might describe generally as Sociometrics) , and related quantitative tools such as numerical analysis and broad approaches such as futurology and technological forecasting; the fundamentals of survey research methods and experimental design; the approach of accounting to financial reporting and accountability; the politics of policy formation in a complex, pluralistic society; and the psychological

* Yehezkel Dror, Design for Policy Sciences (New York: Elsevier, 1971).

aspects of policy formation, in particular the problems of organisation theory and behaviour, the problems of individual and group motivation, and the measurement of perception of policy performance.

There is, of course, a very real danger in such a multidisciplinary approach. If one attempts to throw in everything but the kitchen sink, one inevitably finishes up with a superficial smorgasbord which tries to do a little about a lot and finishes up in the limit doing nothing about everything! This lamentable fate can be avoided, I would argue, only if four conditions obtain, two related to the quality of student input, and two to the nature of the programme offered.

In the first place the course would be directed at students with a good first degree, and preferably with a bit of administrative experience; in such students, and probably only in such a body of students, one can reasonably hope for the maturity of perspective which would make possible success in the objective of the programme.

Second, all students entering the *degree year* would have had to complete qualifying work in all components of the programme for which their preparation was deemed insufficient; the students would thus be ready for an intensive graduate course in all the components of the multidisciplinary year.

Third, the aims of a multidisciplinary programme can only be attained if the objective of the programme is clearly specified, and if the set of courses forms a genuine composite of cognate or related knowledge geared to the specified objective; I would argue that the proposed programme and its components meet this requirement.

Fourth, in the best of situations, with excellent, well-prepared students, and a carefully selected set of course components, a multidisciplinary programme will still fail if the set of courses is not formally and explicitly integrated as an interdisciplinary composite. The approach to such integration is set out in the following three paragraphs.

The range of disciplines comprising the multidisciplinary approach must be demonstrated to constitute a coherent body of knowledge, and formally integrated methodologically. It is proposed that this be done through the agency of a continuing research seminar, relying heavily on practitioner participation and on co-operation with other units within the university (Centre for Research on Federal Financial Relations, Centre for Resource and Environmental Studies, Survey Research Centre) and outside the

university (Commonwealth Scientific and Industrial Research Organisation, public and private sector analysts and managers), and developed around a comprehensive methodology, broadly defined as *System Dynamics and Management Cybernetics*. What does this rather pompous title imply?

The approach of System Dynamics and Management Cybernetics is predicated on the assumption that complexity and uncertainty are central to problems of policy analysis, decision making and implementation and that improved capacity in these three dimensions requires the specification of the stochastic interaction of a complex set of variables over time. The approach requires the acceptance of a systemic approach to the construction of scientific models which implies that the structure of the model be sufficiently complete and the behaviour of the model sufficiently representative to be operationally useful. All policy models are homomorphic, i.e. simplifications or approximations of reality, rather than isomorphic, i.e. complete representations of reality; what is argued is that the model must be a sufficiently complete homomorph to be illustrative of reality, i.e. to be operationally useful. Such an approach to modelling begins with the specification of the objectives—which imply values—of the system under consideration, and the determination of objective-oriented performance criteria of the system. The second stage in the approach is the initial description of the relevant variables in the complex network of system structure, defining the effective limits of the model building exercise and the variables determined to be basic to system structure. The third stage is that of quantifying the complex and uncertain relationships between these variables as the system unfolds over time, i.e. the specification of the behaviour or mechanism of the system. In the nature of complex dynamic systems, the specification of relationships will be stochastic and will be in terms of levels and rates of change; further, the exercise of quantification will be particularly focused on the specification of feedback relationships in the behaviour of the system over time, with both positive feedback relationships which produce self-reinforcing or compounding change, and negative feedback which produces self-regulating or goal-seeking change, and will be concerned with the search for control or policy variables with which to enhance the goal-seeking or self-regulating aspects of the system in pursuit of system objectives. The obligation to quantify relationships is central to the approach, but is conducted in the light of the initial premise that the scientific model be sufficiently representative of reality to be operationally useful. Thus those relationships in the system which cannot be rigorously specified

ADMINISTRATIVE STUDIES PROGRAMME OVERVIEW

BRIDGING OR QUALIFYING WORK

It is expected that *all* students will have to do *some* bridging work, and that students with an ordinary degree will do the equivalent of a full qualifying year.

Taken Previously | | *Given as Part of the Programme*

Economics I and Economics II	OR	1 semester of microeconomics and one of macroeconomics given as graduate make-up courses
Satisfactory preparation in Mathematics	OR	1 semester of graduate make-up course covering basis calculus and matrix algebra
Satisfactory preparation in Computer Science	OR	1 semester unit covering Introductory Computer Science (such a semester unit is presently given by the Department of Computer Science)
Satisfactory preparation in Statistics	OR	1 semester make-up course covering basic statistical methods
Satisfactory preparation in Accounting	OR	1 semester graduate make-up course

DEGREE WORK

Composite prescribed body of knowledge comprising the following CORE UNITS:

2 semester units

Economic Policy Analysis
—Welfare Economics
—Revenue Policy
—Expenditure Policy
—Regulation
—Miscellaneous Issues

2 semester units

Quantitative Methods
—Cybernetics and System Dynamics
—Operations Research
—Numerical Analysis
—Sociometrics
—Futurology and Technological Forecasting

1 semester unit

Procurement and Analysis of Data
—Survey Research Methods
—Experimental Design

1 semester unit

Financial Reporting and Accountability
—Measurement and Valuation
—Financial Reporting and the Capital Market
—Financial Reporting and Parliamentary Control

BRIDGING OR QUALIFYING WORK

Taken Previously | | *Given as Part of the Programme*

Satisfactory preparation in Political Science	OR	1 semester graduate make-up course
Satisfactory preparation in Psychology	OR	1 semester graduate make-up course
1 full course in Administrative or Constitutional Law	OR	1 semester graduate make-up course covering Administrative and Constitutional Law

DEGREE WORK

1 semester unit

The Politics of Policy Formation and Administration
—The Politics of Policy Formation

1 semester unit

The Psychological Aspects of Policy Development
—Organisation Theory
—Motivation
—Measurement Indicators of Policy Perception

Multidisciplinary Research Seminar
—Meeting each week of year
—Using facilities of staff within the university (Centre for Research on Federal Financial Relations, Centre for Resource and Environmental Studies, Survey Research Centre, etc.) and without (Commonwealth Scientific and Industrial Research Organisation, Government Departments, private sector)
—Using as a linking methodology the approach of *system dynamics and management cybernetics*
—Forming the base from which each student would develop a project report and analysis to be completed in the final three months of a twelve-month degree programme

mathematically are not omitted, but are incorporated formally in the system by simpler quantitative devices such as specification of logical relationships, simple directional relationships, or ordinal and cardinal measurement scales. Such an approach to model construction implies the testing and validation of the operational usefulness of the model by iterative experimentation and by simulation (either on a computer or in some form of gaming). This approach to quantification we may describe as aspiring to structural and behavioural rigour rather than mathematical rigour.

In short, the essence of the proposed interdisciplinary methodology lies in an attempted marriage of the decision and behavioural sciences, and in the development of a new set of paradigms about policy problems on the basis of comprehensive systemic model building, albeit approximations of reality (many-to-one homomorphic mappings) which nevertheless have sufficient variety, i.e. sufficient structural and behavioural complexity, to serve as adequate surrogates for the greater complexity of reality, and offer conclusions which further the design, choice and implementation of policies which will achieve their specified objectives.

It would be appropriate, I believe, to stress at this point that the proposed programme is not in any sense a purely applied exercise, derivative from the existing body of theory. On the contrary, the search for a new set of paradigms and a new methodological synthesis defines a major aspect of the programme as theory evaluation and construction. The theoretical base and its application are indeed viewed as entirely complementary in the programme, the theoretical base nourishing the application of theory and concepts, providing testable hypotheses, and being continually modified and improved in the light of its success in application, the application of concepts and theory being correspondingly improved in the light of theoretical and conceptual developments. It is this very emphasis on the theoretical and conceptual apparatus which distinguishes the programme from its entirely complementary counterparts as technical colleges and colleges of advanced education in Australia.

LOGIC AND LAW: SOME INTERDISCIPLINARY PROBLEMS

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> ". . . logic, and history, and customs, and utility, and the accepted standards of the right conduct, are the forces

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> which singly or in combination shape the progress of the law."
>
> CARDOZO, B. N.[1]

LOGIC. A word which is in everyday use in the judicial exercise. Do we understand it? Are we able to find its exact place in law and legal reasoning?

The question of the significance of logic in law and its place in legal reasoning cannot be answered without difficulties. It is much easier to say where to look for an answer: in method. And a method of law or of its exercise is the way in which legal statements are motivated.

But how should a legal statement be created? As any other statement? As, perhaps, a mathematical theorem? As a scientific statement? But can the legal system use the method applied by science? Or is it, perhaps, a science itself?

Consideration of these questions is the topic of this essay. If we do find here a final answer we may at least succeed in partially clearing the way to it.

The opinion that "neither law nor human nature is an exact science"[2] is widely accepted. Even if "there is no way by which modern law can escape from the scientific and artificial character imposed on it by the demand of modern societies in full, equal, and exact justice".[3] Pound asks the questions directly: "But what do we mean by the word 'scientific' in this [legal] connection? What is scientific law? What constitutes science in the administration of justice?"[4] He notices the clue given here by Pollock who finds three reasons for which law has to take a scientific character: the demand for (i) full justice, (ii) equal justice, and (iii) exact justice. The attributes of law are, thus, conformity to reason, uniformity, and certainty and this, certainly, shows that "this scientific character of law is a means—a means toward the end of law, which is administration of justice".[5]

We said "certainly", although it is certain only under two conditions: (i) that law in its essence is separated from its scientific character and (ii) that this scientific character is a means toward the end of law.[6] We shall assume that the first condition is false: it is not possible to separate anything from its character. If so, if law is the same thing as its scientific character, then the second condition has to turn out to be false for law cannot be a means of its own end.

Pound is right when he says that "law is not scientific for the sake of science"[7] and he is right that it is a means towards an end.